

Claims

1. A process for the recycling of PET constituents at least, from plastics beverage bottles which have been comminuted to form a mixture of particles containing PET flakes, wherein the flakes are subjected to a washing treatment in at least one washer, **characterised in that** the flakes are treated mechanically, and are simultaneously treated hydraulically, in the washer at least, in a cleaning solution which contains caustic soda, at an elevated temperature higher than 70°C and for more than 20 minutes.

2. A process according to claim 1, **characterised in that** the treatment time in the washer is set to about 20 to 40 minutes, preferably to about 30 minutes, and the treatment temperature is set to about 75 to 95°C, preferably to about 80 to 90°C.

3. A process according to claim 1, **characterised in that** a treatment time is used for cleaning the PET bottles, in a customary cleaning solution containing caustic soda, for instance, which is considerably prolonged, preferably by about 50 %, compared with that which is customarily used for cleaning PET bottles, and that the treatment temperature and the concentration of the cleaning solution are increased compared with those customarily used for cleaning PET bottles.

4. A process according to claim 1, **characterised in that** mechanical stirring and high-pressure hydraulic spraying are effected in the washer.

5. A process according to claim 1, **characterised in that** sieving and/or filtration is effected in the washer or following the washer.

6. A process according to claim 1, **characterised in that** at least one additive is added to the cleaning solution.

7. A process according to claim 1, **characterised in that** the flakes which are cleaned in the washer are subsequently treated, likewise in the cleaning solution which contains caustic soda, in at least one float-sink separator.

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8. A process according to claim 7, **characterised in that** after the float-sink separator the flakes are intensively washed in at least one intensive washer in the cleaning solution which contains caustic soda.

9. A process according to claims 7 and 8, **characterised in that** the material to be treated is treated in the float-sink separator and in the subsequent intensive washer with recirculation or at least with partial recirculation.

10. A process according to claim 8, **characterised in that** following the intensive washing stage the cleaning solution which contains caustic soda is separated from the flakes and recycled.

11. A process according to claim 1, **characterised in that** the concentration of the cleaning solution which contains caustic soda is continuously monitored and is adjusted by metered additions.

12. A process according to claim 1, **characterised in that** the washer is heated.

13. An apparatus for the recycling of PET flakes from beverage bottles which have been comminuted to form a mixture of particles, comprising a treatment section in which at least one washer which comprises a stirrer and at least one float-sink separator are provided for treating the mixture of particles, **characterised in that** a feeder device (F, 14 - 19) for a cleaning solution which contains caustic soda, and a heater device (P), are associated with the washer (W), and that mechanical and hydraulic treatment devices (26, 28) are provided in the washer (W) for treating the PET flakes.

14. An apparatus according to claim 13, **characterised in that** sieve plates (32, 33, 35) and automatic filters (30) are provided in the washer (W) or in a treatment stage following the washer.

15. An apparatus according to claim 13, **characterised in that** the heater device (P) comprises at least one heat exchanger (WT) and/or a direct heater, preferably with

electro-pneumatic control, for maintaining a treatment temperature which is between 70 and 95°C, and which is preferably approximately between 80 and 90°C, in the washer (W).

16. An apparatus according to claim 13, **characterised in that** nozzle pipes (28) which are connected to at least one pump (29), preferably a high pressure pump, are provided as hydraulic equipment components.
17. An apparatus according to at least one of claims 13 and 14, **characterised in that** the sieve plates, filters and nozzle pipes are fixedly disposed in relation to a plurality of stirrer stages (26).
18. An apparatus according to claim 13, **characterised in that** the sink-float separator (T) is coupled in the process to the washer (W), and can be operated with the hot cleaning solution which contains caustic soda.
19. An apparatus according to claim 13, **characterised in that** at least one intensive washer (D) is disposed downstream of the sink-float separator (T).
20. An apparatus according to claim 19, **characterised in that** a bypass (11) which results in a hold-up circuit in the float-sink separator and simultaneously in the intensive washer is provided between the float-sink separator (T) and the intensive washer (D).
21. An apparatus according to claim 19, **characterised in that** a separator (E) for the cleaning solution which contains caustic soda is disposed downstream of the intensive washer (D).
22. An apparatus according to claim 13, **characterised in that** in the feeder device for feeding the cleaning solution which contains caustic soda to the washer (W) a supply branch (21), which preferably comprises a supply pump (40), is provided at least from the separator (E) to the washer (W).

23. An apparatus according to claim 13, **characterised in that** the feeder device comprises a caustic soda measuring and metering unit (F), which is connected at least to the supply branch (21), and which is preferably also connected to the float-sink separator (T).
24. An apparatus according to claim 23, **characterised in that** a pre-heater device (15) is provided in the caustic soda measuring and metering unit (F).
25. An apparatus according to claim 21, **characterised in that** a neutraliser (G), which is connected to fresh water and to an acid- or CO₂ metering station (41, H), is disposed downstream of the separator (T).
26. An apparatus according to claim 13, **characterised in that** the float-sink separator (T) is connected to a fresh water supply (18).
27. An apparatus according to claim 13, **characterised in that** a heavy material separator (C) is disposed upstream of the washer (W).
28. An apparatus according to claim 13, **characterised in that** the washer (W) is designed with an uptake and throughput capacity for a treatment time > 20 minutes, preferably for approximately 30 minutes.